

Reducing crystallinity on thin film based CMC/PVA hybrid polymer for application as a host in polymer electrolytes

M.A.Saadiyah^{ac}; D.Zhang^b; Y.Nagao^b; S.K.Muzakir^c; A.S.Samsudin^c

^a Department of Chemistry, Centre for Foundation Studies, International Islamic University Malaysia, 26300, Gambang, Pahang, Malaysia

^b School of Materials Science, Japan Advanced Institute of Science and Technology, 1-1 Asahidai, Nomi, Ishikawa 923-1292, Japan

^c Ionic Materials Team, Advanced Material, Faculty of Industrial Sciences & Technology, Universiti Malaysia Pahang, Lebuhraya Tun Razak, 26300, Kuantan, Pahang, Malaysia

ABSTRACT

The carboxymethyl cellulose and polyvinyl alcohol (CMC/PVA) based hybrid polymer (HPe) system with different ratio of composition have been prepared via solution casting. The features of interaction between CMC and PVA were investigated using X-ray diffraction (XRD), and infrared (IR) spectroscopy to disclose the reduction of crystallinity of the HPe system. Morphological properties observed by Scanning electron microscopy (SEM) confirmed the homogeneity of the HPe system. Differential scanning calorimetry (DSC) result explains the miscibility of the HPe system which was confirmed by means of variations in the glass transition temperature (T_g). Two degradation mechanisms were revealed by thermogravimetric analysis (TGA) in the HPe system attributed to the decarboxylation in CMC and degradation of bond scission in PVA backbone. The blend of 80:20 compositions of CMC/PVA HPe system was found to be the optimum ratio with an increase in conductivity of CMC/PVA by one magnitude order from 10^{-7} to 10^{-6} S/cm with the lowest in crystallinity.

KEYWORDS:

Carboxymethyl cellulose/polyvinyl alcohol; Hybrid polymer blend; Structural properties; Conductivity